MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

ECT1016 – CIRCUIT THEORY

(All sections / Groups)

21 OCTOBER 2016
3.00 p.m. – 5.00 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of six pages including cover page with four questions only.

2. Attempt all **FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write your answers in the answer Booklet provided. Show all relevant steps to obtain maximum marks.

Question 1

(a) With the help of neat diagram, explain the following:

(i) Ohm's law [3 marks]

(ii) Kirchoff's current law (KCL) [2 marks]

(iii) Kirchoff's voltage law (KVL) [3 marks]

(b) For the circuit in Figure Q1(b).

(i) Calculate the current flowing through 8 Ω resistor by using Norton's theorem [9 marks]

(ii) Calculate the current flowing through 5 Ω resistor by using Thevenin's equivalent circuit. [8 marks]

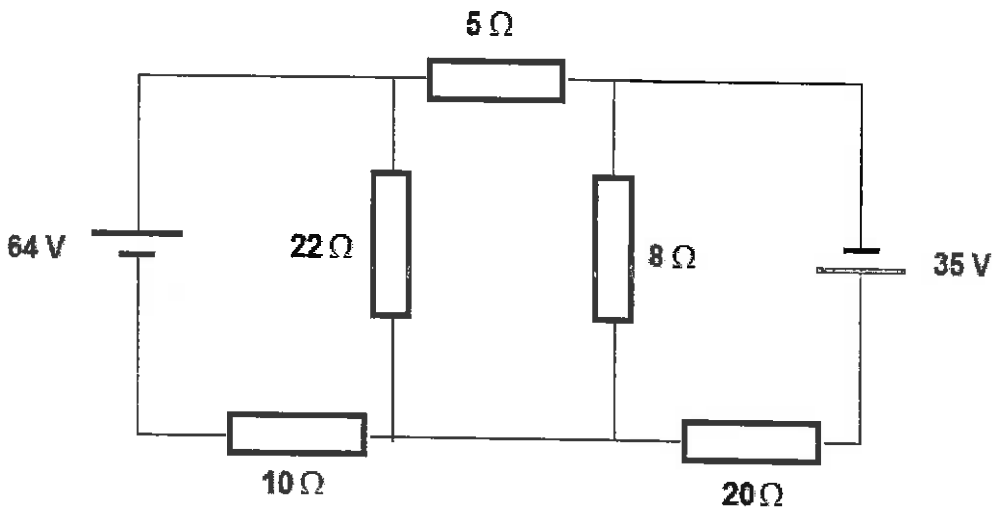

Figure Q1(b)

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Question 2

(a) For the circuit as shown in Figure Q2(a), determine the nodal voltages V_1 and V_2 using Nodal analysis.

[12 marks]

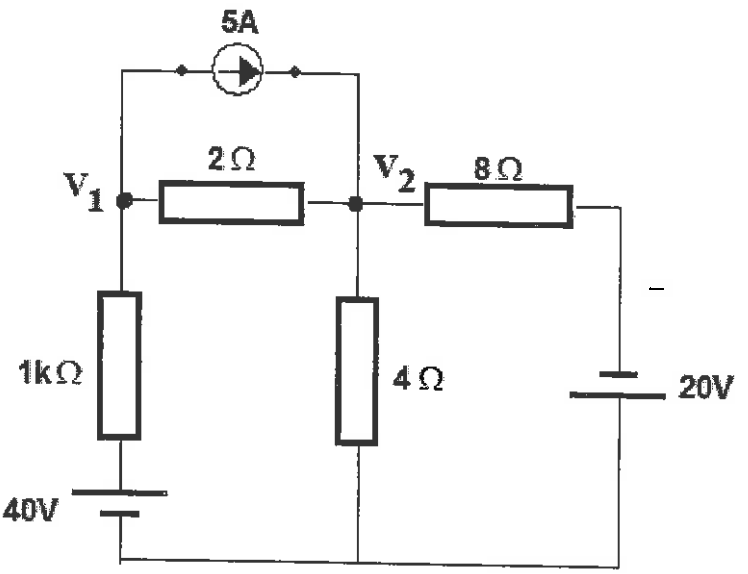


Figure Q2(a)

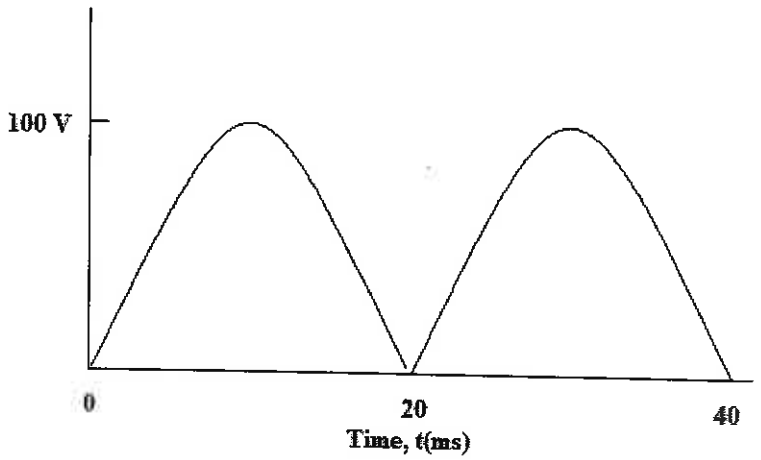
(b) For the waveform shown in Figure Q2(b), calculate:

(i) the fundamental frequency [2 marks]

(ii) average value [4 marks]

(iii) crest factor [5 marks]

(iv) form-factor [2 marks]



Figuare Q2(b)

Continued...

Question 3

(a) The expressions for the steady-state voltage and current at the terminals of the circuit seen in Fig. Q3 (a) are $v_g = 300\cos(5000\pi t + 78°)V$, $i_g = 6\sin(500\pi t + 123°)A$

(i) What is the impedance seen by the source?

[3 marks]

(ii) By how many microseconds the current i_g is out of phase with the voltage v_g?

[3 marks]

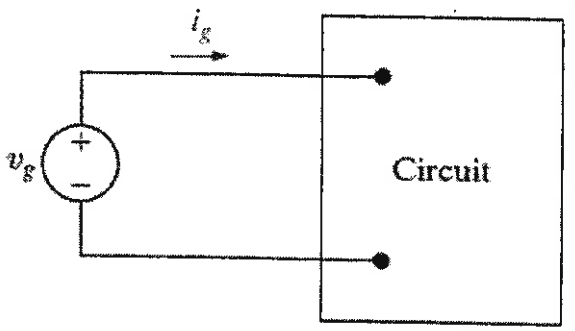


Figure Q3(a)

(b) Find the admittance Y_{ab} in the circuit shown in Fig. Q3 (b). Express Y_{ab} in polar and rectangular form.

[9 marks]

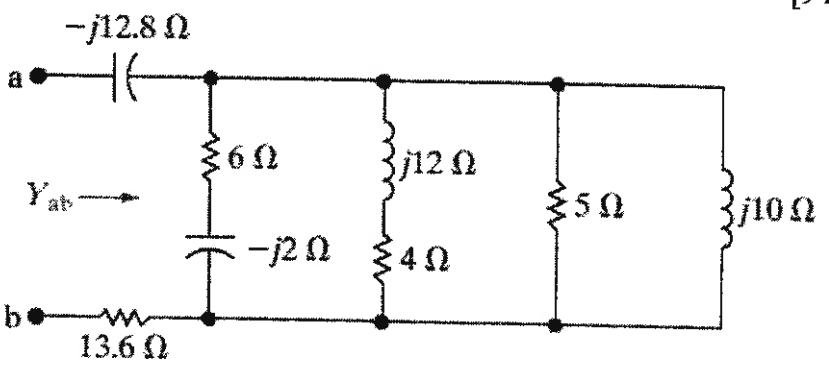


Figure Q3(b)

Continued...

(c) For the network shown in Fig. Q3 (c), determine:

(i) the average power delivered to each element. [2 marks]

(ii) the reactive power for each element. [2 marks]

(iii) the apparent power for each element. [2 marks]

(iv) P_T, Q_T, S_T, and F_p for the system. [2 marks]

(v) Is [2 marks]

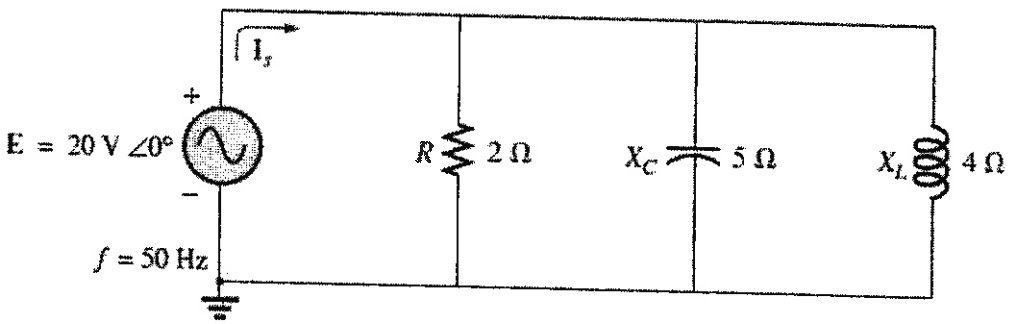


Figure Q 3(c)

Continued...

Question 4

(a) The natural response of an RLC circuit is described by the differential equation $\frac{d^2v}{dt^2} + 5\frac{dv}{dt} + 4v = 0$. Solve for $v(t)$. Assuming initial conditions: $v(0) = 0\,\text{V}$ and $\frac{dv(0)}{dt} = 10$.

[5 marks]

(b) The switch in the circuit shown in Fig. Q4 (b) has been closed for a long time before opening t=0, find:

(i) $i_0(0^-)$, $i_L(0^-)$ and $v_L(0^-)$

[4 marks]

(ii) $i_0(0^+)$, $i_L(0^+)$ and $v_L(0^+)$

[4 marks]

(iii) the expression for $i_L(t)$ for $t \geq 0$

[4 marks]

(iv) the expression for $i_o(t)$ for $t \geq 0^+$

[4 marks]

(v) the expression for $v_L(t)$ for $t \geq 0^+$

[4 marks]

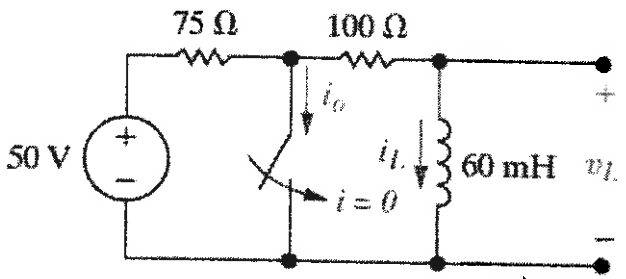


Figure Q4(b)

End of Paper